Activity 7.2 – Graph Analysis Using First and Second Derivatives

1. (a) $f'(x) = (8 - 2x)e^x$

(i) $x = 4$; (ii) $\left(4, 2e^4\right)$; (iii) none; (iv) $(-\infty, 4)$; (v) $(4, \infty)$

(b) $f''(x) = (6 - 2x)e^x$

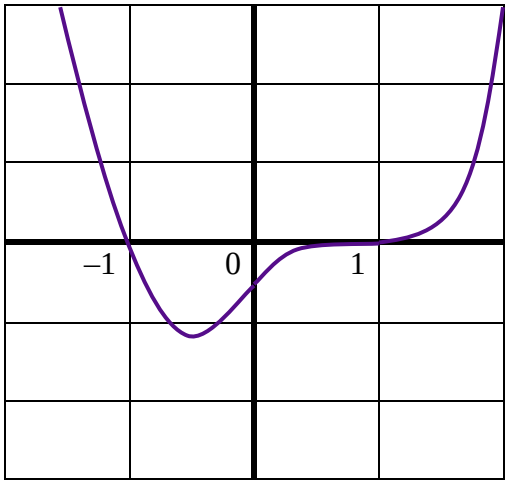
(i) $\left(3, 4e^3\right)$; (ii) $(-\infty, 3)$; (iii) $(3, \infty)$

(c) $f(x) = (10 - 2x)e^x$

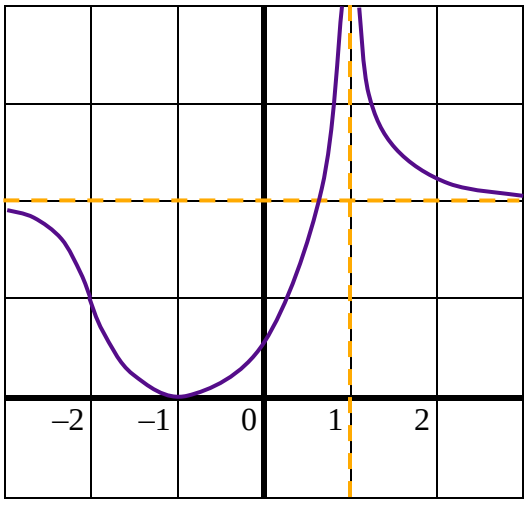
(i) $x = 5$; (ii) $y = 10$

(iii) $\lim\limits_{x \to +\infty} (10 - 2x)e^x = (-\infty)(+\infty) = -\infty$; $\lim\limits_{x \to -\infty} \frac{10-2x}{e^{-x}} \overset{LR}{=} \lim\limits_{x \to -\infty} \frac{-2}{-e^{-x}} = 0$

2.



3.



4. (a) Moving to left: (0, 1) ∪ (5, 6)
Moving to right: (1, 5)
At rest: $t = 1, 5$

(b) Speeding up: (1, 3) ∪ (5, 6)
Slowing down: (0, 1) ∪ (3, 5)

(c) Left of origin: (0, 2)
Right of origin: (2, 6)
At origin: $t = 0, 2$